International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Iot Based Smart Cradle for Infant Health Monitoring Using NodeMCU

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Abstract

In recent years, baby care has become more important and challenging for working mothers. Even at home, working mothers will not have enough time to monitor their babies continuously. They give the responsibility of their baby to either a baby caretaker or they send the baby to their grandparents 'house. This project aims at reducing the challenges faced by parent by developing an IOT based Smart Cradle monitoring System that will assist Parent in monitoring their child. This cradle is equipped with a swinging mechanism which swings automatically on detection of baby crying sound. In the proposed work, a smart cradle with an automated baby monitoring system was developed. In the baby monitoring system, the necessary parameters of the infant like temperature, heartbeat rate are measured and monitored. Using an IOT-enabled smart cradle system, parents can keep an eye on their children even when they are far from the house and can track their movements anywhere in the world. This system includes all the information necessary to care for and protect the infant in the cradle. The use of technologies such as Internet of Things (IOT) modules like NodeMCU, temperature sensor, moisture and pulse rate sensors enables the design of intelligence and innovation. All of the conditions that were taken from the modules will be saved in the cloud (thing Speak) and periodically analyzed.

Keywords: Node MCU, Sound Detector, Moisture Sensor, Pulse rate sensor, ThingSpeak.

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INTRODUCTION

IOT is internet of things, which is designed to save time, and for making work easy and accurate. As far as time and security is concern with the help of IOT, we will build a cradle system, which will make parents stress free, and most important it will be safe and secure for the baby. Therefore, managing the work in time and taking care of baby is very important factors. Cradle system will give parents required time to parent for rest, as if the parents both mother and father goes for the job or even if the mother is house wife. Being stress free will definitely create the great atmosphere, which will make great atmosphere around the baby. Therefore, it does not matter if there is no one to swing cradle it will do swing automatically if the baby is crying. It does not matter if baby has done pee and no one knows about for long time, but not need to worry cradle system will also give the alert about the wetness in cradle. Also, if baby is getting fever or cold Cradle system also have the ability to detect it and send the alert. Proposed system will help the parents, so that they can take good care of their baby.

Due to increase in the number of current working mothers for many families, baby care has become a challenging task. Babies are usually sent to grandparent's home or some baby caring centers. Monitoring of babies in normal or abnormal conditions is not possible by parents when babies are at the baby care centers. Therefore, we have proposed an efficient IOT Based Automated Cradle System for Baby Monitoring to monitor babies in real-time, which provides better care for the babies with the use of Internet of Things (IOT) modules like NodeMCU, temperature sensing, moisture and pulse rate sensors enables the design of intelligence and innovation. All of the conditions that were taken from the modules.

BLOCK DIAGRAM

In order to design the smart cradle health monitoring system, the prototype comprises of NodeMCU, temperature sensor, moisture sensor, pulse rate sensor and sound detector. The temperature sensor is used to measure the body temperature of the infant and the value is shown in the I2C display. The moisture sensor is used to detect whether the bed is wet or dry. It is also shown in I2C LCD display. The pulse sensor is used to measure the heartbeat and displayed the information as graph on serial monitor. The sound detector will detect the sound .The data from all sensors are sent to node MCU, and node MCU receives it. Data will be analyzed with the help of a reference. Cloud is the server that will stored data, from there ThingSpeak website get data.

The sound detector always checks whether the infant is crying or not. If it detects the sound, the system will check whether the moisture is detected. If it so, it will turn led and buzzer turns ON and displayed wet on the I2C LCD display. If the moisture is not detected. "Dry" will be displayed on the LCD display; buzzer and LED will be turn off and motor swings the cradle to help the infant sleep.

If the sound is not detected, the system will check the status of the temperature. If the temperature level exceeds the threshold value, the buzzer will turn on and Led will glow and the word "Alert" will appear on the LCD .If the temperature is normal, led and buzzer will be off and the LCD display will show "Safe". The data will be updated in the ThingSpeak cloud and visible the real time data from the ThingSpeak website.

The block diagram can be categorized according to the different sensors illustrated below.

1. NodeMCU
2. Temperature Sensor
3. Moisture Sensor
4. Pulse Sensor
5. Sound Detector

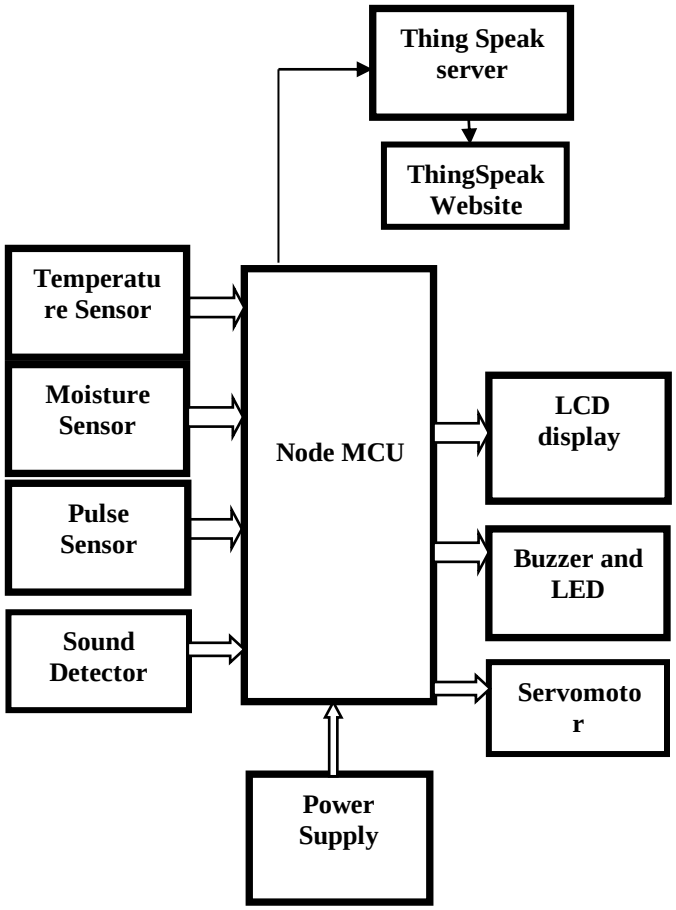

Fig1: Block diagram of the project

A. NodeMCU

The Node MCU (Node Micro Controller Unit) is an open-source platform for implementing the Internet of Things. Running on System-on-a-Chip (SoC), it is inexpensive device which is technically named as the ESP8266-12E and helps to prototype IoT project using script lines in Lua. Espressif Systems designs and manufactures NodeMCU

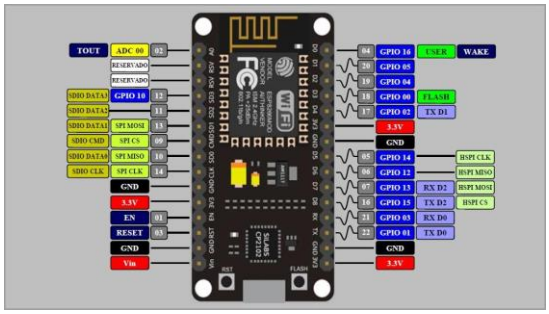

Fig 2: Nodemcu

B. Moisture Sensor

The moisture sensor is used to calibrate the water or moisture content of the soil. Depending upon when the soil has more water content or less water content, the output of the module is at a low level and high level respectively.

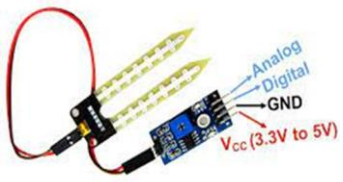

Fig 3: Moisture Sensor

C. Pulse sensor

A pulse wave is the change in the volume of a blood vessel that occurs when the heart pumps blood, and a detector that monitors this volume change is called a pulse sensor.

Fig 4: Pulse Sensor

D. *Temperature sensor*

LM35 is a temperature sensor that outputs an analog signal which is proportional to the instantaneous temperature. It is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. The output voltage can easily be interpreted to obtain a temperature reading in Celsius. The LM35 has an advantage over other temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming and has low output impedance, linear output, and precise inherent calibration that make interfacing to readout or control circuitry especially easy. As it draws only 60 µA from its supply,it has very low self-heating.

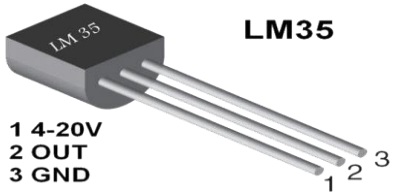

Fig 5: Temperature Sensor

E. *CD4051*

It is an 8-channel analog multiplexer & demultiplexer, controlled by digital signal. So, they are commonly referred as Digitally controlled analog switches.It has low ON impedance and very low OFF leakage current. It dissipates a very low power over full VDD-VSS & VDD-VEE voltage ranges.It can be used for analog to digital (A / D) as well as digital to analog (D / A) conversions.

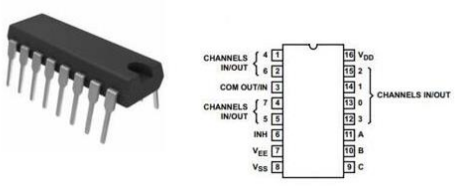

Fig 6: CD4051

F. *Sound Detector*

A sound sensor is defined as a module that detects sound waves through its intensity and converting it to electrical signals. The KY-037 Microphone sound detection module detects loud sounds like slamming doors. The module has an analog and digital output so the sensor can be ready by any microcontroller. The electric microphone in this module is not extremely sensitive. It is designed to detect loud noises (slamming doors, glass breaking, dogs barking, doorbells, alarms, buzzers, etc.). It is not appropriate for detecting low levels sounds such as voice conversations. It consists of 4 pins.

Fig 7: sound detector

G. *Servomotor*

A servo consists of a Motor (DC or AC), a potentiometer, gear assembly, and a controlling circuit

Fig 8: sound detector

RESULTS

The sound detector always checks whether the infant is crying or not. If it detectsthe sound, the system will check whether the moisture is detected. If it so, it will turn ledand buzzer turns ON and displayed “wet” on the I2C LCD display. If the moisture is not detected. Dry” will be displayed on the LCD display. Buzzer and LED will be turn off and motor swings the cradle to help the infant sleep by using servomotor .If the sound is not detected, the system will check the status of the temperature. If the temperature level exceeds the threshold value, the buzzer will turn on and Led will glow and the word “Alert” will appear on the LCD .If the temperature is normal, led and buzzer will be off and the LCD display will show “Safe”. The data will be updated in the ThingSpeak cloud and visible the real time data from the ThingSpeak website The temperature displayed in ThingSpeak and it will show the Green Alarm.

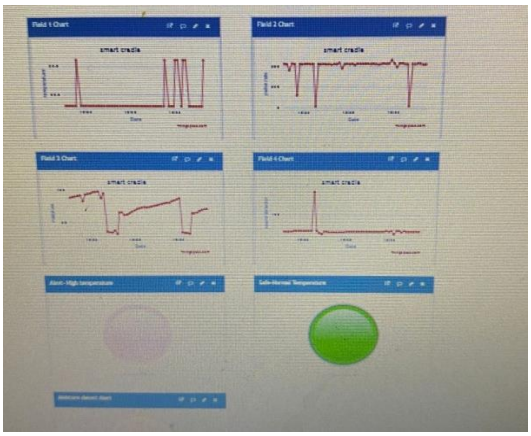

Fig 9: update values in the Thing Speak

The temperature displayed in ThingSpeak and it will show the Red Alarm

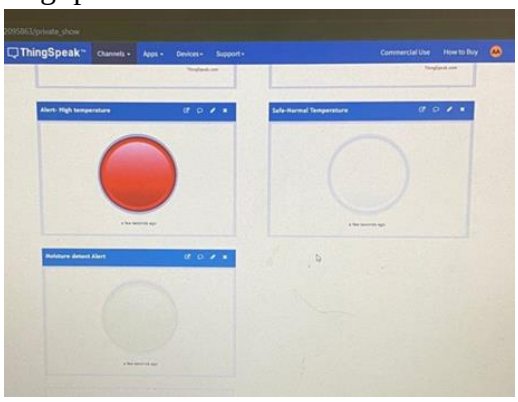

Fig 10: update values in Thing Speak

Serial monitor display of safe temperature in below figure

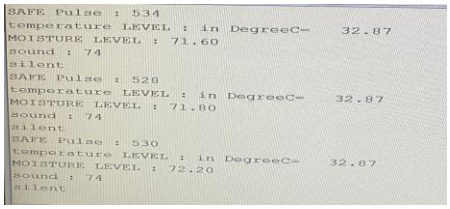

Fig 11: update values in serial Monior

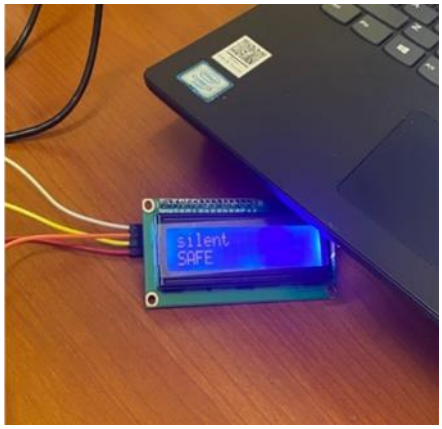

Fig 12: Silent and safe displayed in I2C LCD

CONCLUSION AND FUTURE SCOPE

The proposed project "IOT based Smart cradle system for infant monitoring "has been implemented. We have tested the system and carefully and closely observed the results achieved thereafter. All the hardware components have been integrated to develop the system. The working of each module has been reasoned out with utter carefulness and they have been placed in such a way that they contribute towards getting the best results from the system.We are grateful to God for giving us faith and perseverance to overcome all the difficulties and obstacles that we faced while working on the project. We worked hard on our project, which took up a lot of our time, but we were happy to finish it neatly and neatly, especially the reporting on it. IoT based smart cradle system give convenience and surveillance to parent in real time as compared to conventional cradle It also ensure baby safety while they are not physically present near cradle, so it is efficient to use IOT based smart cradle system to take care of infant in

proficient manner. The Smart Cradle System would also give certain alerts in case of emergency. Hence, the overall project is cost effective and helps the parent to have his or her own time and relieve some stress.

In future, it is possible to add more features to make more efficient and user-friendly. The feature can be added to this device such like rotating toy with music. Another implementation can be continuous video streaming of the baby activities using an IP camera. This will help the parents to look after the baby even if they are not around.Another feature to be added to device is to send SMS to the parent about continuous monitoring of baby. More sensors can be added like to sleeping pattern can be Observed using data science technology. Additional facilities can be triggering emergency from app tracking the baby using GPS can also be added.

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